



Advanced Higher
Course
Specification



Advanced Higher Chemistry Course Specification (C713 77)

Valid from August 2015

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Please refer to the note of changes at the end of this Course Specification for details of changes from previous version (where applicable).

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Course outline

Course title: Advanced Higher Chemistry

SCQF: level 7 (32 SCQF credit points)

Course code: C713 77

Mandatory Units

H7XN 77 Inorganic and Physical Chemistry (Advanced Higher)
8 SCQF credit points

H7XP 77 Organic Chemistry and Instrumental Analysis (Advanced Higher)
8 SCQF credit points

H7XR 77 Researching Chemistry (Advanced Higher) 8 SCQF credit points

Course assessment 8 SCQF credit points

This Course includes eight SCQF credit points to allow additional time for preparation for Course assessment. The Course assessment covers the added value of the Course. Further information on the Course assessment is provided in the Assessment section.

Recommended entry

Entry to this Course is at the discretion of the centre. However, learners would normally be expected to have attained the skills, knowledge and understanding required by the following or equivalent qualifications and/or experience:

- ◆ Higher Chemistry Course

Progression

This Course or its Units may provide progression to:

- ◆ an HND/degree in a chemistry-based course or a related area
- ◆ a career in a chemistry-based discipline or related area

Further details are provided in the Rationale section.

Equality and inclusion

This Course Specification has been designed to ensure that there are no unnecessary barriers to learning or assessment. The individual needs of learners should be taken into account when planning learning experiences, selecting assessment methods or considering alternative evidence. For further information, please refer to the *Course Support Notes*.

Rationale

All new and revised National Courses reflect Curriculum for Excellence values, purposes and principles. They offer flexibility, provide more time for learning, more focus on skills and applying learning, and scope for personalisation and choice.

In this Course, and its component Units, there will be an emphasis on skills development and the application of those skills. Assessment approaches will be proportionate, fit for purpose and will promote best practice, enabling learners to achieve the highest standards they can.

This Course provides learners with opportunities to continue to acquire and develop the attributes and capabilities of the four capacities, as well as skills for learning, skills for life and skills for work.

All Courses provide opportunities for learners to develop breadth, challenge and application, but the focus and balance of the assessment will be appropriate for the subject area.

Relationship between the Course and Curriculum for Excellence values, purposes and principles

Chemistry, the study of matter and its interactions, contributes essential knowledge and understanding across all aspects of our lives. Chemistry explains the links between the particulate nature of matter and the macroscopic properties of the world. Chemistry research and development is essential for the introduction of new products. The chemical industry is a major contributor to the economy of the country.

Successful learners in chemistry think creatively, analyse and solve problems. Chemistry can produce responsible citizens through studying the impact that chemistry makes on developing sustainability, and its effect on the environment, society, and the lives of themselves and others. Chemistry courses should encourage resilience, through practical activities and autonomous learning which leads to becoming a confident individual.

An experimental and investigative approach is used to develop knowledge and understanding of chemistry concepts.

The Course provides opportunities for learners to recognise the impact chemistry makes on developing sustainability, and its effects on the environment, on society and on the lives of themselves and others.

Purpose and aims of the Course

The purpose of the Advanced Higher Chemistry Course is to develop learners' knowledge and understanding of the physical and natural environments beyond Higher level. The Course builds on Higher Chemistry, continuing to develop the underlying theories of chemistry and the practical skills used in the chemistry laboratory. The Course also develops the skills of independent study and thought that are essential in a wide range of occupations.

The Course also serves to equip all learners with an understanding of the impact of chemistry on everyday life, and with the knowledge and skills to be able to reflect critically on scientific publications and media reports concerning chemistry. By using the broad skills base and knowledge and understanding of detailed chemistry key areas, learners will become scientifically literate citizens and be able to review the science-based claims they will meet and to communicate in an evidence-based manner. This also allows learners to make their own reasoned decisions on many issues within a modern society increasingly dependent on chemistry, science and technology.

The relevance of chemistry is highlighted by the study of the applications of chemistry in everyday contexts. The purpose of the Course is to build on the knowledge, understanding and skills developed by the learner in Higher Chemistry and to provide a useful bridge towards further study of chemistry.

The Advanced Higher Chemistry Course aims to enable learners to:

- ◆ develop a critical understanding of the role of chemistry in scientific issues and relevant applications, including the impact these could make on the environment/society
- ◆ extend and apply knowledge, understanding and skills of chemistry
- ◆ develop and apply the skills to carry out complex practical scientific activities, including the use of risk assessments, technology, equipment and materials
- ◆ develop and apply scientific inquiry and investigative skills, including planning and experimental design
- ◆ develop and apply analytical thinking skills, including critical evaluation of experimental procedures in a chemistry context
- ◆ extend and apply problem solving skills in a chemistry context
- ◆ further develop an understanding of scientific literacy, using a wide range of resources, in order to communicate complex ideas and issues and to make scientifically informed choices
- ◆ extend and apply skills of independent/autonomous working in chemistry

The Course provides well-mapped concept and skills development pathways. The Course develops scientific understanding of issues relating to chemistry, and uses the development of chemical theory to build an extensive set of skills for learners. Through application of a detailed knowledge and understanding of chemical concepts, in practical situations, learners develop an appreciation of the impact of chemistry on their everyday lives.

The Course gives opportunities for learners to develop the ability to think analytically, creatively and independently, and to make reasoned evaluations. Learners' creativity will be developed and encouraged through opportunities to generate new ideas when planning and designing investigations and experiments, which they will carry out.

Learners' creativity will be developed and encouraged through opportunities to generate new ideas when planning and designing investigations and experiments, which they will carry out.

The key skills of scientific inquiry and investigation are integrated and developed throughout the Course. The Units offer opportunities for collaborative and independent learning, set within familiar and unfamiliar contexts.

Practical investigative skills are particularly important at this level. This is reflected in the opportunity to carry out high-quality experimental work within all the Course Units and particularly in the Advanced Higher *Researching Chemistry* Unit, which incorporates both practical techniques and skills of scientific investigation.

The Course allows flexibility and personalisation by offering choice within the key areas studied.

The Course content has been selected to allow learners to study key chemical concepts within situations of personal relevance, using up-to-date contexts. Skills of scientific investigation, communication skills, literacy and numeracy are all developed within the Course.

Information about typical learners who might do the Course

The Course is designed for all learners who can respond to a level of challenge, especially those considering further study or a career in chemistry and related disciplines. It takes account of the needs of all learners, and provides sufficient flexibility to enable learners to achieve in different ways.

The Course is suitable for learners who are secure in their learning of Higher Chemistry or an equivalent qualification. This Course emphasises practical and experiential learning opportunities, with a strong skills-based approach to learning.

The Course will allow opportunities for learners to develop chemical knowledge and skills that directly relate to real situations. On completing the Course, learners will have developed analytical thinking skills, inquiry and investigative skills, and problem solving and practical skills.

Literacy is developed, as reading and interpreting scientific literature is encouraged. Learners will be given opportunities to develop scientific ideas and opinions in a coherent logical manner.

Advanced Higher Chemistry encourages independent learning and allows learners to make connections between science and the world in which they live, learn and work. Learners will develop transferable skills and be better prepared for future study and/or employment. Due to the interdisciplinary nature of the sciences, learners taking this Course along with other science subjects will enhance their skills, knowledge and understanding.

On successful completion of this Course, learners could progress to:

- ◆ HND/degree programmes in a chemistry-based course or a related area, such as medicine, law, dentistry, veterinary medicine, engineering, environmental and health sciences
- ◆ careers in a chemistry-based discipline or related area, or in a wide range of other areas, such as oil and gas exploration, renewable energy development, engineering, technology, pharmaceuticals, environmental monitoring, forensics, research and development, management, civil service and education

As well as providing an excellent grounding for the future study of chemistry and chemistry-related subjects, the Course also equips all learners with an understanding of the positive impact of chemistry on everyday life.

Other learners may choose this Course because they have a particular interest in the subject and wish to take the opportunity of studying it in depth.

Course structure and conditions of award

Course structure

Units are statements of standards for assessment and not programmes of learning and teaching. They can be delivered in a number of ways. Units can be taught sequentially or in parallel to each other. However, learning and teaching approaches should provide opportunities to integrate skills, where possible.

Inorganic and Physical Chemistry (Advanced Higher)

This Unit develops a knowledge and understanding of the principles and concepts of inorganic and physical chemistry. Learners will discover how electromagnetic radiation is used in atomic spectroscopy to identify elements. They will extend an understanding of the concept of atomic structure by considering atomic orbitals and electronic configuration related to the periodic table. Using electron pair theory, learners will predict the shape of molecules. Learners will gain an understanding of the physical and chemical properties of transition metals and their compounds. Learners will investigate the quantitative component of chemical equilibria. They will develop their understanding of the factors which influence the feasibility of chemical reactions. Learners will progress their understanding of reaction kinetics by exploring the order and mechanisms of chemical reaction.

Organic Chemistry and Instrumental Analysis (Advanced Higher)

This Unit develops a knowledge and understanding of organic chemistry. Learners will research the structure of organic compounds, including aromatics and amines, and draw on this to explain the physical and chemical properties of the compounds. They will consider the key organic reaction types and mechanisms, and link these to the synthesis of organic chemicals. Learners will discover the origin of colour in organic compounds and how elemental analysis and spectroscopic techniques are used to verify chemical structure. They will study the use of medicines in conjunction with the interactions of the drugs.

Researching Chemistry (Advanced Higher)

In this Unit, learners will be given the opportunity to gain an understanding of stoichiometric calculations, to develop practical skills and to carry out research in chemistry. Learners will develop the key skills associated with a variety of different practical techniques, including the related calculations. Equipped with the knowledge of chemistry apparatus, techniques and an understanding of concepts, learners will identify, research, plan and safely carry out a chemistry practical investigation of their choice. The Unit will equip learners with the scientific background and skills necessary to analyse scientific articles and use them in order to make informed choices and decisions.

Conditions of award

To gain the award of the Course, the learner must pass all of the Units as well as the Course assessment. The required Units are shown in the Course outline section. Course assessment will provide the basis for grading attainment in the Course award.

Skills, knowledge and understanding

Further information on the assessment of skills, knowledge and understanding for the Course is given in the *Course Assessment Specification*. A broad overview of the mandatory subject skills, knowledge and understanding that will be assessed in the Course is given in this section.

These include:

- ◆ extending and applying knowledge of chemistry to new situations, interpreting and analysing information to solve complex problems
- ◆ planning and designing chemical experiments/investigations, using reference material and including risk assessments, to test a hypothesis or to illustrate particular effects
- ◆ carrying out complex experiments in chemistry safely, recording systematic detailed observations and collecting data
- ◆ selecting information from a variety of sources and presenting detailed information appropriately, in a variety of forms
- ◆ processing and analysing chemical information/data (using calculations, significant figures and units, where appropriate)
- ◆ making reasoned predictions and generalisations from a range of evidence/information
- ◆ drawing valid conclusions and giving explanations supported by evidence/justification
- ◆ critically evaluating experimental procedures by identifying sources of uncertainty, suggesting and implementing improvements
- ◆ drawing on knowledge and understanding of chemistry to make accurate statements, describe complex information, provide detailed explanations and integrate knowledge
- ◆ communicating chemical findings/information fully and effectively
- ◆ analysing and evaluating scientific publications and media reports

Skills, knowledge and understanding to be included in the Course will be appropriate to the SCQF level of the Course. The SCQF level descriptors give further information on characteristics and expected performance at each SCQF level (www.sqa.org.uk/scqf).

Assessment

Information about assessment for the Course is included in the *Course Assessment Specification*, which provides full details including advice on how a learner's overall attainment for the Course will be determined.

Unit assessment

All Units are internally assessed against the requirements shown in the *Unit Specification*.

They can be assessed on an individual basis or by using other approaches which combine the assessment for more than one Unit.

They will be assessed on a pass/fail basis within centres. SQA will provide rigorous external quality assurance, including external verification, to ensure assessment judgments are consistent and meet national standards.

The assessment of the Units in this Course will be as follows.

Inorganic and Physical Chemistry (Advanced Higher)

Learners who complete the Unit will be able to:

- ◆ apply skills of scientific inquiry and draw on knowledge and understanding of the key areas of this Unit to carry out an experiment
- ◆ draw on knowledge and understanding of the key areas of this Unit and apply scientific skills

Organic Chemistry and Instrumental Analysis (Advanced Higher)

Learners who complete the Unit will be able to:

- ◆ apply skills of scientific inquiry and draw on knowledge and understanding of the key areas of this Unit to carry out an experiment
- ◆ draw on knowledge and understanding of the key areas of this Unit and apply scientific skills

Researching Chemistry (Advanced Higher)

Learners who complete the Unit will be able to:

- ◆ apply skills of scientific inquiry and draw on knowledge and understanding of the key areas of this Unit to research, plan and carry out investigative practical work on a chosen chemistry topic
- ◆ draw on knowledge and understanding of the key areas of this Unit to apply scientific skills

Exemplification of possible assessment approaches for these Units is provided in the *Unit Assessment Support*.

Course assessment

Courses from National 4 to Advanced Higher include assessment of added value. At National 5, Higher and Advanced Higher, the added value will be assessed in the Course assessment. The added value for the Course must address the key purposes and aims of the Course, as defined in the Course rationale. It will do this by addressing one or more of breadth, challenge or application.

In the Advanced Higher Chemistry Course, added value will focus on:

- ◆ breadth
- ◆ challenge
- ◆ application

Learners will draw on, extend and apply the skills they have learned during the Course. This will be assessed within a [question paper](#)¹ and a [project](#)², requiring demonstration of knowledge, skills and understanding acquired from across the Units and how they can be applied in unfamiliar contexts and/or integrated ways.

¹ Definitions can be found here: www.sqa.org.uk/sqa/47692.html

² See link above for definitions.

Development of skills for learning, skills for life and skills for work

It is expected that learners will develop broad, generic skills through this Course. The skills that learners will be expected to improve on and develop through the Course are based on SQA's *Skills Framework: Skills for Learning, Skills for Life and Skills for Work* and drawn from the main skills areas listed below. These must be built into the Course where there are appropriate opportunities.

1 Literacy

- 1.1 Reading
- 1.2 Writing

2 Numeracy

- 2.1 Number processes
- 2.2 Money, time and measurement
- 2.3 Information handling

5 Thinking skills

- 5.3 Applying
- 5.4 Analysing and evaluating
- 5.5 Creating

Amplification of these skills is given in SQA's *Skills Framework: Skills for Learning, Skills for Life and Skills for Work*. The level of these skills will be appropriate to the level of the Course. Further information on building in skills for learning, skills for life and skills for work for the Course is given in the *Course Support Notes*.

Administrative information

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History of changes to National Course Specification

Course details	Version	Description of change	Authorised by	Date
	1.1	Minor changes to Aims and Skills and Unit Outcomes.	Qualifications Development Manager	April 2015

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